



CENTRIFUGE TRAINING FOR HIGH-G AIRCREW

AFI 11-404, 22 July 1994, is supplemented as follows:

Chapter 5

AETC TRAINING PROCEDURES

5.1. Overview. A timely, effective anti-G straining maneuver (AGSM) is crucial to survival in the sustained high-G environment. The specialized undergraduate pilot training (SUPT) and pilot instructor training (PIT) centrifuge programs and Fighter Aircrew Conditioning Program (FACP) discussed in this chapter are in addition to the AFI 11-404 programs already discussed. These programs provide AETC instructors and students basic G-awareness and AGSM skills which are reinforced during daily flight training.

5.2. SUPT Centrifuge Training:

5.2.1. Purpose. SUPT centrifuge training exposes students selected for the fighter/bomber track to the demands of sustained high-G flight. While the primary purpose of this training is to refine the student's AGSM in a controlled environment, the demands of the centrifuge also reinforce the importance of physical and mental preparation necessary in the high-G arena. This training is familiarization only—no pass/fail standard needs to be achieved. The aerospace physiologist conducting the training will report poor performance to the student's unit commander so additional emphasis on AGSM performance and physical conditioning can be incorporated into the student's training program.

5.2.2. Requirements. All students identified for training according to AETC Syllabus P-V4A-A, *Specialized Undergraduate Pilot Training (T-38), Fighter/Bomber*, will attend this training.

★5.2.3. Academic Instruction. Conduct a minimum of 1 hour of platform academic instruction detailing proper AGSM execution and protection offered by current anti-G equipment. Accomplish a comprehensive video debrief with all students after exposure to centrifuge training profiles.

5.2.4. **Centrifuge Profiles.** All aircrew will train in the 13-degree upright seat. Accomplish the following training profiles in the order listed:

5.2.4.1. **First Profile.** Gradual onset run to 4 Gs for 20 seconds. The purpose of this run is to stimulate the cardiovascular reflex and to determine the effectiveness of the AGSM. The anti-G suit will be off for this run.

5.2.4.2. **Second Profile.** Moderate onset run to 5 Gs for 30 seconds. The purpose of this run is to practice the AGSM. The anti-G suit will be connected for this and all subsequent runs.

5.2.4.3. **Third Profile.** Rapid onset (6 Gs) run to 6 Gs for 30 seconds. The purpose of this run is to further practice the AGSM.

5.2.4.4. **Fourth Profile.** Rapid onset (6 Gs) run to 7.5 Gs for 15 seconds. The purpose of this run is to establish aircrew confidence in their ability to operate in the high-G environment.

5.2.4.5. **Fifth Profile.** Rapid onset (6 Gs) run to 6 Gs for 10 seconds in the “check 6” position (looking over left shoulder). The goal is to maintain 6 Gs for 10 seconds.

5.2.5. **Noncompletion of Training.** Handle noncompletion of training due to factors beyond the student’s control according to paragraph 2.3. For noncompletion due to student performance, the centrifuge facility manager will notify the student’s unit commander. Because this training is familiarization only, no other follow-on action is required.

5.2.6. **Documentation.** A qualified aerospace physiologist will document completion of training on AF Form 702, **Individual Physiological Training Record**. Document training as “AETC SUPT Centrifuge.”

5.3. Pilot Instructor Training (PIT) Centrifuge Training:

5.3.1. **Purpose.** G-awareness and centrifuge training during PIT are designed to increase the G-awareness knowledge level of instructor pilots (IP) so they can better instruct G-awareness to undergraduate flying training students. Students must develop a proper AGSM, which becomes an instinctive reaction to the anticipation of the onset of G. IPs will be able to critique a student’s AGSM and set a positive example with an effective AGSM. IPs will also be able to discuss with students the problems of flying in the high-G environment and how to prevent G-induced loss of consciousness (GLOC). Proactive IPs, completely knowledgeable in G-awareness and capable of instructing solid AGSMs, will positively affect student performance and safety in the high-G environment.

★5.3.2. **Requirements.** All T-3, T-37, and T/AT-38 PIT students must attend the academic instruction on G-awareness. Those pilots who have not flown high-G aircraft (HGA) within 3 years or have not completed centrifuge training from one of the facilities listed below are required centrifuge training as described in paragraph 5.3.4. T-3 IPs do not require centrifuge training, but require only academic instruction within 90 days of being assigned to the T-3 aircraft. Documentation of previous centrifuge training includes:

5.3.2.1. CAF initial or refresher centrifuge training according to AFI 11-404 conducted at Holloman AFB.

5.3.2.2. RNLAU Unit, Soesterberg AB, Netherlands.

5.3.2.3. Warminster Navy Centrifuge.

5.3.2.4. AETC PIT centrifuge training.

5.3.2.5. Centrifuge training at Tachikawa, Japan.

5.3.2.6. Turkish Aeromedical Center, Eskisehir-Turkey.

5.3.3. **Platform Academic Instruction.** Conduct academic instruction according to AETC IG F-V5A-A/B-CT-IG, *G-Awareness and Centrifuge Training*, covering the effects of acceleration forces on mobility and circulation, characteristics of GLOC, and protection offered by AGSM techniques and current and future anti-G systems. Aerospace physiologists will also provide instruction on the techniques of an effective AGSM, common errors in performing an AGSM, and instructing and critiquing an AGSM. The instructional session will also include an interactive discussion of the impact of physical conditioning, lifestyle, and proper nutrition on individual G-tolerance and the effectiveness of the AGSM.

5.3.4. **Centrifuge Profiles.** All T-37 student IPs will train without an anti-G suit. Configure the seat in the 13-degree (upright) position. All T-38 student IPs will wear an anti-G suit; configure the seat in the 13-degree (upright) position. International officers will train using the profile most appropriate to their follow-on aircraft. Videotape all profiles. Each pilot will receive a thorough debrief after the completion of all profiles. Accomplish the following training profiles in the order listed:

5.3.4.1. **First Profile.** Gradual onset run to second peripheral light loss (after initiation of AGSM) or 7 Gs, whichever occurs first. The T-38 student IPs will not have the anti-G suit turned on for this run. The purpose of this run is to determine the pilot's resting G-tolerance (established by first peripheral light loss) and the effectiveness of the AGSM (straining tolerance to second light loss or 7 Gs).

5.3.4.2. **Second Profile.** Rapid onset run to 4.5 Gs (5.5 Gs for T-38) for 20 seconds. The T-38 student IPs will have the anti-G suit turned on for this run and the remaining centrifuge profiles. The purpose of this run is to practice the proper AGSM. An aerospace physiologist will provide a critique of the AGSM following the profile.

5.3.4.3. **Third Profile.** Rapid onset (6 Gs) run to 6 Gs (T-37) or 7.5 Gs (T-38) for 15 seconds. This is the training goal. If the student IP cannot meet this goal, he or she can successfully complete centrifuge training by meeting the minimum standard of 5.5 Gs (T-37) or 7 Gs (T-38) for 15 seconds. The student IP will be allowed to attempt the minimum standard a second time on the same day, if he or she receives additional instruction on the AGSM. If the student IP cannot achieve the minimum standard, debrief him or her, provide information on physical conditioning, and schedule additional training at the Randolph Aerospace Physiology Training Flight. See paragraph 5.3.5.

5.3.4.4. **Fourth Profile.** Rapid onset run to 4 Gs (T-37) or 5 Gs (T-38) for 10 seconds during “check six” position (looking over left shoulder). The purpose of this profile is to ensure an effective AGSM in this position.

5.3.4.5. **Fifth Profile.** Rapid onset run to 3.5 Gs (T-37) or 4.5 Gs (T-38) for 15 seconds, using muscle tensing but no respiratory strain. Recognizing that an IP performs many G maneuvers which do not require the protection of the full AGSM, this profile is designed to teach the proper technique under these conditions. The IP is taught to begin any G maneuver with the full AGSM (full breath of air) then decrease the strain to an “as needed” level. The student IP will demonstrate that he or she can talk while combating the effects of low G maneuvering with muscle tensing only. Do not teach this technique to undergraduate flying students.

★5.3.5. **Noncompletion of Training.** If training is incomplete due to factors beyond the aircrew’s control, the only action required is to reschedule training.

5.3.5.1. **First Attempt Failure.** Failure to meet minimum training standard (5.5 Gs for 15 seconds for T-37; 7 Gs for 15 seconds for T-38) will result in noncompletion of training. Do not medically ground the pilot following the first attempt beyond the 12-hour automatic DNIF. Complete the following procedures for each student IP who does not pass the minimum standard during the first training session.

5.3.5.1.1. **Notification.** The centrifuge instructor will notify the squadron commander in writing of the noncompletion of training.

5.3.5.1.2. **Retraining.** Within 1 week, the individual’s flight commander will ensure the student IP is scheduled for additional training at the Randolph Aerospace Physiology Training Flight. This training will include review of his or her videotape and training report from the first training attempt, review of the proper AGSM, review of the physical conditioning program provided, and lifestyle factors (rest, nutrition, hydration) which affect G-tolerance. The 12th Aerospace Medicine Squadron, Physiological Training Flight (12 AMDS/SGPT) will forward AETC Form 803A, **Student Activity Record**, documenting retraining to the flight commander. Flight line activities will support the retraining process.

5.3.5.1.3. **Scheduling Second Centrifuge Run.** Schedule the student IP for a second attempt with the next PIT class going through training (approximately 5 weeks). The T-37 profile will consist of a warmup and AGSM practice as directed by the aerospace physiologist, usually a rapid onset of 4.5 Gs for 20 seconds. The T-37 student IP will then complete the minimum standard of 5.5 Gs for 15 seconds without an anti-G suit. The T-38 profile will consist of a warmup and AGSM practice as directed by the aerospace physiologist, usually a rapid onset of 5.5 Gs for 20 seconds. The T-38 student IP will then complete the goal of 7 Gs for 15 seconds with an anti-G suit.

5.3.5.2. **Second Attempt Failure:**

5.3.5.2.1. 12 AMDS/SGPT will notify the student IP’s squadron commander as soon as possible in writing of the second attempt failure. The student is DNIF until evaluated by a flight surgeon. Conduct a medical and operational review with the following individuals present: student IP, flight commander, squadron commander or operations officer, centrifuge instructor, and flight surgeon. The goal of this review is to establish a retraining program. The flight commander will document this review on AETC Form 803A.

5.3.5.2.2. 12 AMDS will report, in writing, to the squadron commander failure to make progress and improve performance in the high G environment. The squadron commander will recommend disposition of the student to the 12th Operations Group Commander (12 OG/CC). The 12 OG/CC will notify 19 AF/DO and HQ AETC/SGP of the student disposition.

5.3.6. **Documentation.** A qualified aerospace physiologist will document completion of training on AF Form 702. Document training as "AETC PIT Centrifuge."

5.4. Centrifuge Training for Flight Surgeons:

5.4.1. **Flight Surgeons Trained at Brooks AFB Prior to 1 January 1995.** Flight surgeons trained in the centrifuge at Brooks AFB during AMP or RAM courses prior to 1 January 1995 may submit a tape of the training with their AF Form 702 to the Surgeon General (HQ AETC/SG) for review. HQ AETC/SGP and Chief of Aerospace Physiology (HQ AETC/SGT) or their designees will review the tapes to determine if the flight surgeon demonstrated adequate understanding of the correct AGSM and met the appropriate G-tolerance standards for initial training. Flight surgeons meeting these criteria on tape review will receive an entry for initial training on their AF Form 702. Flight surgeons failing to meet these criteria must accomplish initial training before flying in high-G onset rate aircraft as described in paragraph 1.3.5.1.

5.4.2. **Flight Surgeon Centrifuge Training at Brooks AFB After 1 January 1995.** Flight surgeons attending AMP or RAM courses after 1 January 1995 may undergo initial training at Brooks AFB. Requirements for completing initial training remain in accordance with paragraph 2.2. Flight surgeons failing to achieve initial certification during these courses are not considered first attempt failures, but will undergo initial training at Holloman AFB before flying in high-G onset rate aircraft.

5.5. **Centrifuge Training at Brooks AFB.** Training is authorized at Brooks AFB for flight surgeons, aerospace physiologists, and pilot instructor training (PIT) students.

5.6. **Formal Training Prerequisite.** Centrifuge training in accordance with chapter 2 or 3 of this instruction, or an AFMOA/SGOO-sanctioned Air Force equivalent program, is a prerequisite for foreign aircrew attending AETC high-G aircraft formal training.

5.7. Inflight G Tolerance Problems:

5.7.1. **G-Induced Physiological Incidents.** G-induced loss of consciousness (GLOC) or visual blackout incidents are considered G-induced physiological incidents.

5.7.2. **Flying Training.** A flight surgeon will evaluate students experiencing GLOC during flying and the incident will be reported as a physiological mishap according to AFI 48-123, *Medical Examination and Standards*, and AFI 91-204, *Safety Investigations and Reports*. Additional instruction from an aerospace physiologist on AGSM technique is recommended. If a student experiences more than one G-induced physiological incident (GLOC or blackout), the flight surgeon will report the situation to the Aerospace Medicine Branch (HQ AETC/SGPA) before clearing the student for further flying.

5.7.3. **Formal Training Unit (FTU) Courses.** The following paragraphs give procedures for evaluation and disposition of students experiencing G-induced physiological incidents in FTU. A flight surgeon will

evaluate any student experiencing GLOC during flight and report the incident as a physiological mishap according to AFIs 48-123 and 91-204. The evaluation should include careful review of the HUD tape by the flight surgeon and instructor pilot. Aerospace physiologists are excellent resources for additional AGSM instruction.

5.7.3.1. Prior to Initial Centrifuge Training. If a student who waived to enter FTU without initial centrifuge training experiences a G-induced physiological incident, restrict the student to dual-only flying until completion of initial centrifuge training. Follow the procedures in chapter 2 in the event of centrifuge training failure.

5.7.3.2. After Completing Initial Centrifuge Training. A flight surgeon will evaluate any student experiencing more than one G-induced physiological incident during an FTU course, report by telephone to HQ AETC/SGPA before clearing the student for further flying duties. A medical condition that diminishes the student's G-tolerance or G-endurance requires a medical waiver to continue flying duties. Consider repeat centrifuge training for less than optimum AGSM.

5.7.3.3. Persistently Inadequate G-Tolerance. The flight surgeon and squadron operations officer will evaluate any student who fails repeat centrifuge training or experiences recurring difficulties meeting training objectives due to the effects of G forces. Restrict the student to dual-only flying during the evaluation. The flight surgeon will forward a summary of the medical evaluation to HQ AETC/SGPA. A medical waiver is required to continue flying duties if a medical condition is suspected to be diminishing the student's G-tolerance or G-endurance. A healthy student unable to perform satisfactorily under G forces despite repeat centrifuge training will be handled administratively. If administrative procedures move the student to a low-G weapon system, 19 AF/DO will determine if the aircrew should be restricted from future duties as an IP in the T-38 or T-37. If such restriction is warranted, 19 AF/DO will inform HQ Air Force Personnel Center, Fighter/Bomber Assignments Branch (HQ AFPC/DPAOC) by memorandum.

★5.8. Fighter Aircrew Conditioning Program (FACP). The goals of FACP are to improve the G-tolerance, G-endurance, and cockpit strength of fighter aircrews; identify and correct insufficiently conditioned aircrews before they enter the high-G environment; and establish effective physical conditioning habit patterns. FACP adds scheduled anaerobic fitness training and testing to all AETC, undergraduate flying training (UFT), introduction to fighter fundamentals (IFF), and FTU courses for fighter- or potential fighter-bound students.

5.8.1. Scheduled Anaerobic Fitness Training. Incorporate anaerobic fitness training in all student syllabi from the phase 1 of UFT through fighter FTU graduation, or track selection to low G aircraft. Students will participate in syllabus scheduled anaerobic training sessions according to AFPAM 11-404, *G-Awareness for Aircrew*, at least three times per week. Sessions should last at least 1 hour. Document weekly training in gradebook. Senior officers are exempt from the fighter aircrew conditioning test (FACT) and FACP, but are encouraged to participate. Participation in this program is encouraged, but optional, for joint service and international students and IPs. Students who track select to low-G aircraft may participate in FACP on a voluntary basis. SUPT PIT, FTU upgrade instructor pilot (UIP), and requalification (TX-2) fighter students will participate in syllabus-directed conditioning programs and FACT as familiarization (FAM) only since the lengths of their courses may be too short to reach FACT goals.

NOTE: T-37, T-38, IFF, and FTU flight training instructors should participate in anaerobic and aerobic conditioning programs as well, to improve their fitness and G-tolerance, and because they are important role models.

5.8.2. Fighter Aircrew Conditioning Test (FACT). The FACT provides students and trainers information they need to assess individual anaerobic strengths and weaknesses and focus anaerobic training on proper areas. FACT testing is mandatory as described in paragraphs 5.8.2.1, 5.8.2.2, and 5.8.2.3 for AETC students except for senior officers (colonel and above).

5.8.2.1. Requirements. Every Air Force SUPT student should pass the FACT before starting IFF. Test students during phase 1 of UFT to establish individual baselines and provide maximum opportunity to meet goals by UFT graduation. Test students again at the start of the T-38 phase to measure progress and determine who needs extra effort to succeed. Conduct recurring testing at IFF and FTU to ensure students continue to meet program goals. Testing requirements for T-37, T/AT-38, and FTU instructors are being evaluated. Instructor participation in FACP is encouraged, but not required.

5.8.2.2. FACT Administration. Aerospace physiology personnel administer the FACT on AETC-provided Cybex equipment. Individuals must complete a minimum of ten 6-second count repetitions in each of five strength events, plus 20 pushups, 30 abdominal crunches, and 20 endurance leg presses each in 60 seconds. There is a 1-minute rest period between each event and between strength and endurance portions of the test. See attachment 1 for guidance on conducting the FACT using AETC Form 1705, **Fighter Aircrew Conditioning Test Score Sheet**.

5.8.2.3. Failure to Meet FACT Goals. Enter individuals who do not meet FACT goals into a flight commander-supervised conditioning program with emphasis on correcting weak areas. In the event a student cannot pass the FACT prior to UFT graduation, the aerospace physiology training flight commander will notify the student's squadron commander by memorandum. The squadron commander will review the student's training records, including SUPT centrifuge results, and recommend disposition to the operations group commander. The operations group commander will notify 19AF/DO through the wing commander with a copy to HQ AETC/SGP. The 19 AF/CC will make the final determination on student disposition.

★5.9. Form Prescribed. AETC Form 1705.

RICHARD C. MARR, Maj Gen, USAF
Director of Operations

1 Attachment (Added)(AETC)
Fighter Aircrew Conditioning Test (FACT) Guidance

★FIGHTER AIRCREW CONDITIONING TEST (FACT) GUIDANCE (ADDED)(AETC)

A1.1. Overview. This attachment provides guidance for conducting the AETC FACT. The FACT will determine an individual's muscle fitness as it applies to operating high-G aircraft and identify anaerobic weaknesses that can be improved through specific physical conditioning described in AFPAM 11-404. Anaerobic fitness (muscle strength and endurance) is essential to performing effective anti-G straining maneuvers without fatigue. Aerobic fitness (measured in ergometry testing) increases blood supply to the working muscles which significantly reduces recovery time between engagements and sorties. Contact HQ AETC/DOFF if you have any questions.

A1.2. FACT Guidelines. The FACT contains eight exercise events divided into two categories: strength and endurance. Administer the test in the order provided on AETC Form 1705. To pass this test, individuals must complete a minimum of 10 repetitions in each of 5 events in the strength category plus the minimum required repetitions in all 3 events in the endurance category (unless specific test events are excluded by the flight surgeon and documented on the test subject's AF Form 1042, **Medical Recommendation for Flying or Special Operational Duty**). Do not count repetitions above the maximum. Calculate the individual's total FACT score by adding together the strength and endurance scores.

NOTE: Ensure individuals stretch out and warm up sufficiently before beginning the FACT to reduce risk of injury. Test subjects should do a few light-weight repetitions in each event before lifting the required amount to improve their warmup effectiveness and to establish proper form. Maintaining proper form is important to reduce the risk of injury. Individuals with poor anaerobic fitness are at great risk trying to exceed their capabilities. Test administrators should stop the test anytime it appears injury is likely. Notify the individual's supervisor and reschedule the test later after the individual has completed additional training.

A1.3. Strength Events. This portion of the test measures muscular strength and consists of five events. Provide individuals a 60-second rest period between events. Only Cybex equipment, supplied by HQ AETC/DOFF, is approved for use in administering the FACT. The test administrator must calculate the percentage (weight factor) of the individual's body weight (weigh with shoes off and subtract 3 pounds for clothes) for each event to determine the amount of weight the subject is required to lift. Round to the nearest 5 pounds. Write the lift requirements in the spaces provided. (Example: Capt Smith weighs 190 pounds. He would be required to lift 65 pounds (190 multiplied by .35 equals 66.5; round to 65) in the arm curl; 150 pounds in the bench press; 135 pounds in lat pulls; 305 pounds in leg press; and 95 pounds in leg curls.) Individuals must complete a minimum of *10 repetitions in each event* to pass this test.

A1.3.1. Record the number of repetitions completed in the space provided between the "minimum repetitions" standard and "maximum repetitions" allowable numbers (section II). Remember, the minimum standard must be achieved for any points in an event. Total the five events and write the score in the Strength Score (section IV). If an individual does not complete the minimum requirements to pass, enter "0" in the Strength Score (section IV).

A1.3.2. Every repetition (rep) should consist of a 2:3:1 second count. That is, the pushing or pulling (concentric phase) motion will take 2 seconds; the return to the starting position (eccentric phase) will take 3 seconds; and the pause between repetitions will take 1 second. This slower speed is more difficult than the way most people lift weights, but *required* for this test. It was designed to measure an

individual's ability to maintain muscle contractions over longer periods of time. The test administrator should demonstrate the procedure and count off each test subject's reps, substituting the number of the rep completed for the "6" count. (Example: "1, 2, 3, 4, 5, (1); 1, 2, 3, 4, 5, (2); etc.") Repetitions should be completed in smooth and controlled movements without dropping the weights against the stack. The test administrator has final determination on procedures and what reps will be counted as meeting requirements. Use common sense for minor variances in form. The requirements for each event are listed in figure A1.1.

A1.4. Muscular Endurance Events. This portion of the test measures the subject's ability to perform repeated muscle movements for a given period of time. Individuals are required to complete a minimum number of repetitions within a 60-second timeframe. Provide a rest period between strength and endurance portions of test; however, both endurance and strength portions of test must be accomplished during the same session. Provide a 60-second rest period between events, but there is no resting permitted while doing an event. If the test subject stops for more than 1 second during an event, the event is over. Record total number of repetitions for each event in section III and write the total score in Section IV. Individuals must complete the minimum repetitions in each event to pass this test (mark zero in total score if minimum is not achieved). The requirements to complete a repetition for each event are listed in figure A1.2.

A1.5. Test Results:

A1.5.1. Total Score/Fitness Category. Collect the scores from each section and record them in the appropriate spaces. Compute the total score by adding the two scores together (section IV). Mark the appropriate fitness category block next to the subject's total score. If minimum repetitions are not accomplished in all events, mark unsatisfactory in fitness category.

A1.5.2. Supervisor Notification. The test administrator will notify supervisors of individual test results by sending a hard copy of the subject's test within 1 week of completion. Supervisors of individuals who fail the fitness test will be notified immediately by telephone and then sent the hard copy results. Document this notification in the block provided.

A1.5.3. Individual Counseling (as required). Anyone who fails the test will be counseled by the aerospace physiologist, entered into a supervised conditioning program, and retested. Document this counseling and recommended conditioning program in the space provided. The aerospace physiologist and test subject will each sign the test.

A1.5.4. Testing Guidelines. UPT and SUPT students will be tested and supervisors will be notified of results prior to assignment selection (or track selection, if applicable). IFF and FTU students will be tested prior to their first syllabus sortie. Retests (if required) will be coordinated between the individual's supervisor and the aerospace physiologist. Mark type of test in section I (for example, initial, annual, or retest). For retest, annotate the number of the retest, such as, retest 1, 2, etc. If for some reason an individual is medically restricted by the flight surgeon to complete specific events *or* the entire test, a copy of the AF Form 1042 excusing him or her will be given to the individual's supervisor and filed with (or in place of) the FACT. **WARNING:** Aircrews *must* be aware that a passing FACT or cycle ergometry score *does not* guarantee acceptable G-tolerance or G-endurance. High-G aircrews must consider a wide range of everchanging personal physiological factors and apply sound judgment in determining personal capabilities on any given day or sortie.

Figure A1.1. Strength Event Requirements.**ARM CURL**

- Adjust seat height so that upper arms are parallel to the floor. Grip handles lightly with palms up.
- Start rep by bending elbows, bringing hands toward forehead.
- Only reps where lower arm travels beyond 90° vertical will count.
- Buttocks must remain on seat pad at all time (no rocking motions).

BENCH PRESS

- Adjust seat height so upper handles (horizontal grips) are level with sternum (just below armpits).
- Grip upper (horizontal) handles.
- Push foot pedal to advance handles so that upper arms extend perpendicular from shoulders and approximately 90° at elbows.
- Slowly release foot pedal and place feet flat on floor platform.
- Start movement by pressing handles forward. Only reps where arms extend to approximate full extension count. (Do not lock out elbows.)
- Complete each rep by returning to starting position (upper arms extending perpendicular from shoulders and 90° at elbows).
- When finished with test, use foot lever to gently lower weights.

LAT PULL

- Adjust height of knee pads so lower legs are perpendicular to floor.
- Grasp the **Close Grip Bar** (small ~ 4 inch bar) palms facing in.
- Back should be slightly reclined and stable (no rocking).
- Start movement by pulling bar down toward chest.
- Buttocks must remain on seat pad at all times.
- Only reps where grip is pulled below shoulder level will count.

LEG PRESS

- Adjust starting position of sled to obtain 90° angle at knees.
- Adjust body position on sled so that head, shoulders, and elbows remain in contact with pads and knees are aligned with toes (maintain foot position that keeps toes at or above height of knees).
- Start movement by straightening legs smoothly.
- Only those reps where legs extend to approximate full extension will count. (Do not lock out knees.)

LEG CURL

- Adjust leg pad so it's positioned just above Achilles tendons.
- Adjust body position on bench so that knees are located off the bench and aligned with the machine axis of rotation.
- Start movement by curling heels towards buttocks.
- Only reps where lower legs travel beyond 90° vertical will count.

Figure A1.2. Muscular Endurance Event Requirements.**PUSHUP**

- Establish a front-leaning position with both legs extended.
- Hands should be shoulder width apart; arms extended (but not locked out).
- After the test administrator says “go,” lower upper body until arms bend to 90° (minimum) and then return to the starting position in one smooth continuous motion.
- Keep back straight.
- Timing starts when the administrator says “go.”
- Only reps (up to maximum) completed in 60 seconds will count.

"AB" CRUNCH

- Lie flat on mat with feet elevated on bench, calves parallel to floor, and knees bent 90°.
- Arms should be crossed on chest with head and shoulders on floor.
- After the test administrator says “go,” curl upper body using only abdominal muscles until arms (between wrist and elbow) make contact with thighs.
- Return to starting position (shoulders must return to mat each time).
- Only reps (up to maximum) completed in 60 seconds will count.

LEG PRESS

- Starting position and basic mechanics are the same as for the strength test, but with a 1.0 weight factor (subject's body weight) and no slow-speed lift requirements as specified in strength tests.
- After test administrator says “go,” start rep by straightening legs.
- Pause briefly in the full-extension position. (Don't lock out knees.)
- Return to starting position (90° angle at knees).
- Only reps (up to maximum) completed in 60 seconds will count.